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The effects or immediate and delayed feedback on perseverance and learning were investigated with a 3 x 3 factcrial design. It was hypothesized that delayed feedback would reduce perseverance while immediate feedback would increase it. Subjects were 72 male ccllege students, paid fcr participation. They read prose sentences and completed cloze test items. Feedback on each sentence was either immediate, delayed, or omitted. A cloze retention test over the sentences was given either immediately, delayed, or was omitted. The time spent reading a continuation of the original passage was recorded as a measure of perseverance. It was found that (1) delayed feedback produced significartly ($p<.05$) more learning on the original task that did immediate feedback, (2) immediate feedback produced significantly ($p<.01$) more perseverance on the continuatien passage than did delayed feedback, and (3) perseverance on the continuation passage was positively correlated (.46) with scores on a comprehension test cver the continuation passage. Tables and references are included. (Author/MS)

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# FEEDBACK AND PERSEVERANCE IN READING

John T. Guthrie

## Abstract

The effects of feedback on perseverance and learning were investigated with a 3x3 factorial design. Adult subjects read prose sentences and completed cloze test items. Feedback on each sentence was either immediate, delayed, or omitted. A cloze retention test over the sentences was given either immediately, delayed, or was omitted. The time spent reading a continuation of the original passage was recorded as a measure of perseverance. The results were that: (a) delayed feedback produced significantly ($p < .05$) more learning on the original task than immediate feedback; (b) immediate feedback produced significantly ($p < .01$) more perseverance on the continuation passage than delayed feedback; and (c) perseverance on the continuation passage was positively correlated (.46) with scores on a comprehension test over the continuation passage.

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Feedback and Perseverance in Reading[1]

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Perseverance refers to the propensity of a learner to invest sufficient time in a learning task to accomplish the goals inherent in the task. Perseverance is distinguished from attention, inspection or mathemagenic behavior by the fact that perseverance is time dependent. An individual who has spent a large period of time engaged in inspection behavior in a learning task has persevered in the task. A certain inspection behavior may occur for a long or short period of time. Only if the inspection occurs for a relatively long time period has perseverance occurred. It is likely that a minimal level of inspection of any verbal learning task must occur if the individual is to learn. Furthermore, it is plausible that perseverance is likely to be highly correlated with the amount of learning which occurs in a variety of learning tasks (Carroll, 1963).

Feedback has been shown to facilitate the learning of psychomotor tasks (Bilodeau & Bilodeau, 1961), meaningful verbal material (Ausubel, 1963) (Guthrie, 1970), concept formation (Bourne, 1966) and a variety of verbal learning tasks (Adams, 1968). However, the influence of feedback on perseverance in a cognitive task has not yet been investigated. Accordingly, the purpose of the present study was to examine whether feedback facilitates or inhibits perseverance in reading tasks.

One parameter of reinforcement and feedback which has been shown to affect learning is delay. In research with animals, delay of

reinforcement has often been found to impair learning (Kimble, 1961). On the contrary, with humans, the delay of reinforcement has been discovered to facilitate the acquisition of concepts (Bourne, 1966), the learning of foreign vocabulary (Brackbill, Wagner & Wilson, 1964) and the retention of complex subject matter (Sassenrath & Yonge, 1968). In each of these studies, delayed feedback was superior to immediate feedback for the improvement of verbal learning.

Although delayed feedback has been found to increase learning on verbal tasks, it is not known how delayed feedback influences perseverance. It is plausible that delayed feedback would be exasperating to the subjects performing a verbal task, whereas immediate feedback would be likely to be reassuring or gratifying. Consequently, it was hypothesized that delayed feedback would reduce the subject's perseverance on the task, while immediate feedback was expected to increase the subjects' perseverance.

## Method

Subjects. The subjects were 72 male college students who received $1.50 per hour for their participation.

Materials. The subject matter learned by the subjects was drawn from the section on archaeology in the Encyclopedia Britannica. The passage used in the learning phase of the experiment was 500 words in length. The sentences in the passage were edited to lengths of 15-25 words. There were 25 such sentences which

comprised the passage. A cloze test of 25 items over the material was constructed by deleting one word from each sentence. The position of the deletion was determined at random with the constraint that an equal number of deletions occurred in the beginning, middle and end of the sentences. The deleted words included only nouns, adjectives, and adverbs. The materials contained in the task used to assess perseverance consisted of a 1,000 word passage which was a continuation of the original topic. A brief 10-item multiple choice test with 4 alternatives for each item was constructed to assess the subjects' comprehension of this second passage.

Treatment Conditions. The experimental design was a 3x3 factorial. The two factors were knowledge of the correct response (KCR) and test (T). The three levels of KCR were: Immediate KCR, Delayed KCR, and No KCR. The three levels of T were: Immediate T, Delayed T, and No T. The primary purpose of the experiment was to examine the effects of immediate and delayed KCR on perseverance and learning. If a design is employed in which only the immediacy of KCR is manipulated, and the test is given immediately following the learning trials, the delay of the test is confounded with the delay of KCR. To avoid this confounding, the time interval between the Response and KCR (KCR delay) was manipulated independently of the time interval between the stimulus and the Test (Test delay) in a factorial manner.

Procedure. The subjects were randomly assigned to one of the nine treatment conditions and were run individually. The

experimenter and the subject were seated on opposite sides of a table and were separated by a tall wooden divider. After reading the instructions for the learning task, the experimenter administered one practice trial. The learning task was then presented. On each trial the subject was presented one sentence and given 10 seconds to read it. The experimenter then removed the sentence and presented a cloze test item consisting of the original sentence with the word deleted. The subject was given 10 seconds to write the answer on a piece of paper. Next, one of the feedback conditions were administered, Immediate KCR, Delayed KCR, or No KCR, for 2 seconds. KCR consisted of seeing the original sentence with the answer included. The subjects in the Delayed KCR condition received KCR after a 20-second interval during which no task was assigned. After going through all the sentences in this way, T was administered. Subjects receiving Immediate T were given a 25-item cloze test made up of the same sentences as those used in the learning trial with the same words deleted. Subjects in the Delayed T condition played a concept formation game for about 8.5 minutes before taking the test. The No T condition consisted of simply omitting this test. Note that the 8.5 minute delay of the test is equal to the sum of the 20-second delays for the KCR. This means that the subjects who were in the Immediate KCR-Delayed T condition had the same average time interval between the occurrence of the stimuli and the test as the subjects in the Delayed KCR-Immediate T condition.

After the completion of the learning phase, the perseverance phase was initiated. The subject was presented a passage of 1,000 words which was a continuation of the original topic. The experimenter instructed the subject to read the passage for as long as he wished and that he would be given a comprehension test over the material when he felt he was ready to take it. The time the subjects spent reading was recorded by the experimenter, and a 10-item multiple choice test was administered when the subject requested it. The time spent reading the material is an index of the subject's perseverance.

## Results

The dependent variable of primary interest was the time spent voluntarily reading the continuation passage which was given to the subjects during the perseverance phase of the study. The critical issue was whether the treatment conditions administered during the learning phase affected the subjects' perseverance in reading the passage. Consequently, a 3x3 analysis of variance was conducted on the time scores. The result was that the feedback factor accounted for a significant portion of variance ($\underline{F} = 4.89$, $df = 2/63$, $\underline{p} < .05$). Neither the main effects of test factor nor the interaction of test with feedback were significant. A post hoc analysis using the Neuman-Keuls procedure indicated that immediate feedback during learning produced significantly more perseverance than delayed feedback ($\underline{q} = 4.37$, $df = 63$, $\underline{p} < .01$).

Although immediate feedback was superior to no feedback and delayed feedback was infereior to no feedback, the differences were not statistically significant. See Table 1.

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Insert Table 1 about here

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It is reasonable to question whether the effect of immediate feedback on perseverance was direct or whether it was indirect, being mediated by the amount of learning on the original passage. It is possible that immediate feedback produced more learning of the original passage than delayed feedback and that the perseverance in reading the continuation passage was facilitated by the amount of learning of the original passage. This question may be answered by examining the correlation of the scores on the immediate retention test for the original passage with the amount of time spent reading the continuation passage. This correlation was .11 which is not significantly different from zero. It is safe to conclude that the amount of learning on the original passage was not related to the perseverance on the continuation of the passage.

A second issue of interest was whether the treatment conditions affected the amount of learning on the original passage. The scores on the immediate retention test on the original passage were examined with a 2x3 analysis of variance. The factors in the analysis included the immediate feedback, delayed feedback,

and no feedback; and immediate test and delayed test. The outcome was that a significant main effect was attributable to feedback ($F$ = 19.38, df - 2/42, $p < .01$). Neither the main effect for test nor the interaction of feedback and test were significant. Subsequent analyses with the Neuman-Keuls procedure indicated that delayed feedback was superior to immediate feedback in facilitating learning ($q$ = 3.09, $df$ = 42, $p < .05$). This result replicates the findings of numerous other investigators that delayed feedback is more likely to facilitate cognitive learning than immediate feedback (Bourne, 1966; Brackbill, Wagner & Wilson, 1964; Sassenrath & Yonge, 1968). In addition, immediate feedback was superior to no feedback in producing learning as measured by the immediate retention test ($q$ = 6.17, $df$ = 42, $p < .01$). See Table 2.

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Insert Table 2 about here

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It is important to know whether the increase in perseverance realized by immediate feedback results in more comprehension of the materials read during the motivation phase. In this regard, it is interesting to note that the correlation between the time spent reading the continuation passage (perseverance) and the score on the brief multiple choice test over the passage was .46 ($p < .01$). This indicates that time spent studying the passage facilitated learning of the material.

## Discussion

The principal findings of this study are that immediate feedback is superior to delayed feedback in facilitating perseverance and that delayed feedback exceeds immediate feedback in producing learning. The latter result confirms the findings of several previous investigations (Bourne, 1966; Brackbill, Wagner & Wilson, 1964; Sassenrath & Yonge, 1968). However, the first result is unique and consequently it requires further discussion.

The most plausible explanation for the effect of immediate and delayed feedback on perseverance is that differential affective responses are elicited by the two feedback conditions. Immediate feedback presented to the subject while he is reading a passage and answering questions over the passage is likely to evoke positive affective responses to one or more aspects of the task situation. Since the written passage is a salient stimulus in this context, positive affective responses may be associated with the passage. Consequently, if a similar passage is presented at a later time, the subject will invest considerable time and energy in order to maintain contact with the material. Conversely, delayed feedback is likely to evoke negative affective responses which are associated with the written material and which lead to the avoidance of similar passages in the future. In other words, immediate feedback procedures approach behavior to some aspect of the reading task, and delayed feedback produces avoidance behavior to the reading task.

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## Footnotes

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Table 1

Perseverance in Reading Following Different Conditions of Feedback and Testing

| | Feedback | | | |
|---|---|---|---|---|
| Test | Immed. | Delayed | None | Average |
| Immediate | 10.60 | 7.95 | 8.71 | 9.09 |
| Delayed | 10.91 | 7.62 | 8.27 | 8.93 |
| None | 9.26 | 6.95 | 8.53 | 8.25 |
| Average | 10.26 | 7.51 | 8.50 | |

Note.--Figures represent mean time in minutes spent voluntarily reading the continuation of the original passage.

Table 2

Learning as a Function of Immediacy of Feedback and Testing

| Test | Feedback | | | |
|---|---|---|---|---|
| | Delayed | Immed. | None | Average |
| Delayed | 19.88 | 17.25 | 12.75 | 16.63 |
| Immediate | 19.12 | 17.25 | 10.00 | 15.46 |
| Average | 19.50 | 17.25 | 11.38 | |

Note.--The cells contain the mean number of cloze items correct on the 25-item immediate retention test.